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A READING READINESS TRAINING PROGRAM FOR PERCEPTUALLY HANDICAPPED KINDERGARTEN PUPILS OF NORMAL VISION. FINAL REPORT.

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BASED ON THE HYPOTHESIS THAT KEPHART PERCEPTUAL TRAINING WOULD SHARPEN VISUAL PERCEPTION IN PERCEPTUALLY HANDICAPPED KINDERGARTENERS, THIS PROGRAM STUDIED 58 SUCH CHILDREN ACCORDING TO THREE CATEGORIES (1) THE FROSTIG DEVELOPMENTAL TEST OF VISUAL PERCEPTION, (2) SOCIO ECONOMIC STATUS, AND (3) VISUAL ACUITY (KEENNESS). THE CHILDREN WERE DIVIDED INTO TWO GROUPS (1) KEPHART-TRAINED, 15 MINUTES PER DAY AND (2) NO SPECIAL TRAINING. AT THE END OF 8 WEEKS, GINN PRE-READING AND LEE-CLARK READING READINESS TESTS WERE ADMINISTERED. THE 3 CATEGORIES WERE EXAMINED BY ANALYSIS OF VARIANCE. RESULTS SHOWED NO SIGNIFICANT DIFFERENCES AS THE RESULT OF KEPHART TRAINING. THE CHILDREN OF HIGH SOCIO-ECONOMIC STATUS WERE BETTER PREPARED FOR READING, REGARDLESS OF TRAINING OR VISUAL ADEQUACY. SOCIO-ECONOMIC FACTORS NOT CONTROLLED FOR IN THIS STUDY MAY AFFECT READING READINESS MORE THAN DO EITHER KEPHART TRAINING OR VISUAL ACUITY. (LG)

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Daniel W. Meyerson, Ed. D.

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Daniel W. Meyerson, Ed. D.

ABSTRACT

Purpose of the Study: To determine the effects of a Kephart-recommended perceptual training program on the reading readiness of perceptually handicapped kindergarten pupils who differ in visual acuity. It was hypothesized that after receiving Kephart training in eye movements and large-muscle coordination, that perceptually handicapped kindergarteners of normal visual acuity would be significantly better prepared for reading than similar children with poor visual acuity.

Procedures: Fifty-eight kindergarten children in the Mountain View School District, Mountain View, California were identified as "perceptually handicapped," having scored at or below the 30th percentile on the Frostig Developmental Test of Visual Perception. These children were also classified according to socio-economic status and visual acuity. Approximately half of the children received Kephart training fifteen minutes a day for eight weeks. The other half received no special treatment. At the end of an eight-week training period, reading readiness tests (Ginn Pre-Reading, Test 3 and the entire battery of the Lee-Clark Reading Readiness Test) were administered to the 57 children remaining. Differences in the treatment, vision, and socio-economic status groups were examined by analysis of variance. Differences were considered significant if the .05 level of confidence was achieved.

Results: There were no significant differences as the result of Kephart training of visual adequacy for the children in this study. The one significant finding was that children of high socio-economic status were better prepared for reading than children of low socio-economic status, regardless of training or visual adequacy.

Conclusion: Factors associated with socio-economic status not controlled for in this study apparently are more closely related to reading readiness than either Kephart training or visual acuity.

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CHAPTER I

THE PROBLEM

Need for the Study

The ability to read is basic to successful school achievement and to adequate functioning in modern society. The non-reader finds it impossible to cope with life personally or professionally except at a very simple level (Ellingson and Cass, 1966).

Many classrooms contain pupils who either cannot read or who read poorly. Significant numbers of these children are normal with respect to factors commonly associated with reading success: intelligence, vision, motivation, experiential background, and current learning environment. In recent years, research studies have focussed increasingly on these otherwise normal pupils who have difficulty learning to read. One direction of speculation is that the problem exists because of dysfunction of visual perception or perceptual-motor mechanisms. It is estimated that pupils with such problems comprise approximately ten percent of the school population. Not only do these children have difficulty in learning to read, but they also fail to respond to ordinary remedial reading techniques (Stuart, 1966). Thus many of them carry their handicap throughout their school years and into adult life. If the school is to fulfill its obligation to make literate as many children as possible, then means must be found of preventing reading difficulties which are the result of perceptual handicaps.

Nature of Visual Perception

The child receives information through his sensory organs, but until that information is processed accurately in the brain it can be of little use to him. Of man's five senses, vision is the major receptor affecting acquisition and processing ability. According to Cohen (1962), vision accounts for two-thirds of the three million impulses processed by the brain every milli-second.

Visual perception is much more than mere seeing. It is the process of giving consistent meaning to that which is observed. It depends on the initial sensory experience plus the meaning given to that experience in the cortex. For perception to occur, the central nervous system must integrate a visual stimulus with attitudes and thoughts, with other sense data, and with glandular and muscular behavior.

The act of visual perception might be described as being to a degree (though not exactly) comparable to the sequence of operations of a super-speed Polaroid camera. In the camera, an object is exposed through a lens onto a sensitive film. Then by means of mechanical and chemical energy, the development process is initiated and a picture usually results. Sometimes, even though the image obtained through the lens may be accurate, the picture may fail to develop; or it may show some distortion if developed. If mechanical or chemical defects are present in the film pack at the time of development, faulty "perception" occurs. The resulting picture looks different from the object it is supposed to represent.

So it is with many perceptually handicapped children. Although there may be nothing wrong with their receptor mechanisms in the retina of the eye, their translator mechanisms in the visual area of the brain may distort, transpose, or simply not register certain of the things observed. Often their problem is further complicated by defects in their perceptual-motor abilities, that is, even if they are able to accurately interpret what they see, they are unable to command their muscles to act effectively upon that information. Unable to successfully coordinate the optic, visceral, and cortical functions properly, the perceptually handicapped child faces almost insurmountable difficulties in trying to learn to read (Cohen, 1962).

Visual perception (and visual perceptual-motor functioning) are learned processes which are shaped and improved through experience (Hebb, 1949). For most children, the major portion of growth in these abilities occurs between the ages of two and seven years (Piaget and Inhelder, 1956). There exists a wide span of differences in perceptual development among individuals (Lehtinen, 1963), ranging from very advanced to seriously handicapped. For the latter, these differences have been ascribed to many causes including early stimulus deprivation (Casler, 1961), birth trauma (de Hirsch, 1957), mixed lateral dominance (Bryant, 1964), delayed maturation (Vernon, 1958), brain damage (Lewis, Strauss, Lehtinen, 1951), and congenital defects (Stuart, 1963). For some children, it appears that their perceptual handicap is manifested in a specific inability to recognize words and letters consistently. Fortunately, regardless of the etiology, the effects can be treated successfully (Kinsella, 1964). There is growing evidence to indicate that most, if not all children who are perceptually handicapped in reading can be identified and trained to perceive letters and words accurately (Stuart, 1963).

Relationship of Reading to Visual Perception Handicaps

The visual perception handicaps associated with reading problems have been given different names by various researchers and clinicians. "Dyslexia", "word blindness", "specific reading disability", "specific language disability", and "specific learning disability" are some of the euphemisms in current practice (Richardson, 1966). These terms are used interchangeably with perceptual handicap in this report even though the original users may have intended slightly different connotations for them.

The reading act is said to consist of two processes: a) identification of the printed symbol, and b) obtaining meaning from the recognized symbol (Russell and Fea. 1963). Children with handicaps in visual perception frequently are unable physically to perform the act of symbol identification; consequently they are unable to derive meaning from those symbols.

The child with a visual perception difficulty which is specific to the reading act may see the letter "b" as "d", "p", or "q"; he may confuse "saw" with "was", and mistake "ever" for "never". Generally, the perceptually handicapped child substitutes, reverses, miscalls, and skips letters or words. He is apt to reread the same material with different mistakes, to lose his place in moving from one line to another, and to proceed on the wrong line without awareness of the loss in meaning (Kinsella, 1964). As Kephart points out:

> For the child who has been unable to form consistent visual perceptions of the environment, the words on a page of print may become a mass of meaningless marks.... Worst of all they may look different to him at different times and under different circumstances (1964, p. 201).

Though nearly all children up to age six have difficulties of this kind, the perceptually handicapped child's omissions, reversals, and transpositions are far more numerous and persist much longer. If his problem continues undiagnosed, he is almost always doomed to a school life of frustration and failure. He may wonder what serious personal deficiency prevents him from mastering a task (learning to read) which is accomplished satisfactorily by most of his classmates. His parents may find themselves needlessly guilt-ridden, wondering to what extent their child-rearing practices may have contributed to their child's inability to learn this most important communication skill.

Soon those assisting him with learning have to cope with a residue of emotional factors which were not necessarily present before the child's exposure to the reading task. This needlessly complicates a condition which might otherwise be ameliorated through maturation (Vernon, 1958) and/or remedial perceptual training measures. Obviously, if children with faulty visual perception were identified and trained to perceive more accurately before encountering formal reading activities, emotional pressures could be lessened. Consequently, there could be considerable saving in grief to many children, worry to many parents, and remediation expense to the taxpayer (Cole, 1951).

Up to this point, the discussion has assumed the existence of a causal relationship between faulty perception and poor reading. It must be pointed out that evidence supporting this assumption is only correlational. Direct methods of examining the brains of children who have failed to learn to read have seldom been possible (Robinson, in Hunnicutt and Iverson, 1958, p. 249.) The indirect methods which attempt to link perception and reading achievement (such as tests of visual perception) are largely inferential in nature. Furthermore, a dilemma is posed by the fact that multiple handicaps may be present for any non-reader. An early statement by Backus and Monroe still awaits refutation:

> Reading disabilities are usually the result of several contributing factors rather than one isolated cause. Studies of causes of reading disabilities reveal no clear-cut factors which occur only in poor readers but never in good readers. Some children who possess the impeding factors appear to be able to read in spite of them.... A few good readers are found who have many of the handicaps associated with poor reading.... We may conclude that in most cases one factor alone is not sufficient to inhibit the act of reading, if compensating abilities are present, and if the child's reaction to the difficulty is a favorable one (1937, p. 12).

Notwithstanding the probability of multiple causation, and regardless of whether "perceptual handicap" is a physiological entity or merely a theoretical construct, the fact remains that a significant percentage of children who exhibit symptoms of poor perception do not learn to read by ordinary methods. This fact has prompted investigators to search for more refined methods of identifying and treating the child who exhibits the behaviors which are called "perceptual handicaps".

Such identification and training programs have been tried out in recent years by numerous researchers including Delacato (1963), Spache (1963), Kephart (1960), Frostig (1964), and McBeath (1966), although controlled studies are few.

Using the Frostig Developmental Test of Visual Perception (1964) as an identification measure, and training methods of Frostig and Kephart, McBeath conducted an experimental study to assess the effect of such programs on the reading readiness ability of perceptually handicapped pupils at the kindergarten level (1966). An after-the-fact analysis of her data revealed what appeared to be a significant difference in the effects of training in large muscle coordination and eye movements (as prescribed by Kephart) on the reading readiness of pupils with normal and deficient visual acuity. Perceptually handicapped pupils with a visual acuity rating of 20/30 or worse in either eye appeared not to benefit as a result of training. Those with 20/25 or better vision seemed to improve significantly in their reading readiness as measured by the Lee-Clark Reading Readiness Test (1962). Apparently, some children score low on a test of visual perception because of poor visual acuity and therefore training in perception alone seems to have no effect on their reading readiness performance scores. This suggested the need to experiment in order to empirically verify the effects of Kephart-recommended perceptual training activities on perceptually handicapped pupils who differ in visual acuity. Such is the intent of this study.

Nature of Visual Acuity

Visual acuity is a term which optometrists define as "a measure of sharpness of seeing" (Blum, 1959, p. 142), or "the capacity to recognize small-space intervals in the discrimination of form" (Luckiesh, 1942, p. 6). It is measured at a distance of 20 feet (Far Visual Acuity), and less commonly at a normal reading distance of 16 inches (Near Acuity). A person is said to have normal visual acuity when he can see at a distance of 20 feet what the average person can see at that distance. A visual acuity of 20/20 means that at 20 feet the observer can read a letter 8.86 millimeters square with details that are one-fifth the overall size (Jobe, 1953). An acuity score of 20/40 means that at 20 feet the smallest letter the observer can see is one that should be readable at 40 feet.

The exact relationship of perception to visual acuity continues under investigation. In reviewing the conflicting results of several research studies attempting to link vision defects with reading achievement, Robinson wonders "Is there a relationship between visual efficiency and reading progress except in individual cases?" (1953, p. 28).

It might be possible that perceptual ability necessary for the acquisition of reading skills is only marginally related to physiological visual acuity.

The study reported on the following pages attempted to more clearly establish the relationship between visual perception, visual acuity, and a training program in perception designed to improve the reading readiness of perceptually handicapped kindergarten children. For the purposes of this research, a child was considered perceptually handicapped if he scored at or below the 30th percentile on the Frostig Developmental Test of Visual Perception. He was considered to have poor vision if his acuity rating was 20/30 or worse in either eye as revealed by examination with the Modified Clinical Technique (Blum and others, 1959).

Role of Socio-economic Status

Recent investigations of culturally disadvantaged children's learning patterns reveal marked differentials in perceptual ability according to socio-economic status (Bloom and others, 1965). Response to different types of training appears to vary according to culturally-induced characteristics of the child, also (Covington, 1962).

Research information is lacking concerning interaction effects of reading readiness training and visual adequacy with the socio-economic status of perceptually handicapped children. Therefore, the dimension of socio-economic status was also analyzed in this study.

CHAPTER II

RELATED RESEARCH

Visual Perception: A Multidisciplinary Concern

The phenomenon of visual perception as it affects the acquisition of reading skills has been a continuing concern of psychologists, physicians, optometrists, neurologists, and educators for more than 50 years. Indeed, lack of coordination of the research findings of these different disciplines has complicated the task of diagnosing and treating the dyslexic child (Ellingson and Cass, 1966).

Various labels, identification procedures, etiological theories, and treatment methods have been advanced over the years without a firm consensus emerging. In recent years, however, certain trends have become dominant. For one thing, successful treatment has led to wide agreement that unlike some other functional disabilities, the causal factors in a perceptual handicap are relatively unimportant. As Kinsella states:

> It is really of little importance whether the disability is caused by brain damage, poor muscular coordination, mixed hand-eye dominance, or emotional instability. The important aspect is that the effect can be treated and the problem eliminated (1964, p. 1).

A second emerging area of concurrence is the recognition of the need for the earliest practical diagnosis of perceptual handicaps which may inhibit the acquisition of reading skills (Stuart, 1963). A variety of diagnostic tools have been tested and found to have high validity and reliability. Techniques in this area are being constantly refined and improved.

Finally, supplementing and supplanting earlier training programs, new instructional systems are being developed to assist children in overcoming specific perceptual handicaps which are believed to be associated with current or potential reading problems. All need to be tested further under controlled conditions.

A hopeful sign for the future lies in the fact that researchers and practitioners in the fields of psychology, optometry, neurology, and education are beginning formally to combine their knowledge and skills about perception in a cooperative attack in the problem (Ellingson and Cass, 1966).

Identification of Handicaps in Visual Perception

Since approximately 10 percent of all school children have visual perception deficiencies serious enough to interfere with their acquisition of reading skills, and since it is important that identification of such handicaps occur as early as practicable, recent research has focused on the need for and the development of mass screening instruments for use with young children.

Minimal brain damage or malfunction has been the cause most often suggested for deficiencies in visual perception (Strauss and Kephart, 1955; McBeath, 1966). It is not surprising, therefore, that some of the methods used in identifying brain-damaged children have been applied successfully in discovering the presence of perceptual handicaps (Strauss and Kephart, 1955).

Many studies have confirmed the value of assessment procedures which use copying ability as a predictor of school success.

Investigations by Gesell during the 1930's noted that among young children the ability to copy simple forms was related to perceptual ability (1940). Fabian (1945) discovered that retarded readers showed inferior copying test performance when compared with normal pupils.

In comparing a wide variety of measures for ability to discriminate brain-injured from non-brain injured children on normal intelligence, two measures were found by Strauss and Kephart (1955) to be much superior to all the others. These were the Ellis Visual Designs and the Marble Board Test. Both of these require the subject to reproduce (copy) designs from a model.

Copying of geometric figures is the method by which the Perceptual Forms Test (1965) identifies children with suspected perceptual limitations. Developed under the sponsorship of the Winter Haven (Florida) Lions Club, the Perceptual Forms Test has been used in numerous studies linking visual perception with subsequent school achievement. Lowder (1956) and Kagerer (1960) conducted the earlier studies confirming the test's usefulness as a selector of perceptually handicapped low-achieving pupils. Since the test has been validated as a measure of perceptual ability for school beginners and since it can be administered relatively quickly and easily to groups of children, it was selected as the initial screening device in this study.

Identification measures which present other kinds of tasks to the child have also been found successful. Tracing, outlining, duplicating, matching, object and symbol discriminating, and simple drawing tests have been incorporated in testing instruments in various combinations.

Goins (1953) found a significant relationship among a variety of such tests and reading success in first grade. Harootunian (1961) reported similar findings in the upper elementary grades. Working with the exercises presented in the Bender-Gestalt Test and Human Figure Drawings, Koppitz (1959) has established a relationship between scores on those tests and later school success. After applying similarly constructed diagnostic tests, Shedd (1961) discovered symbolic confusion or poor visual perception to be a factor among children experiencing reading difficulties at all ages.

Perhaps the single most comprehensive diagnostic screening instrument for visual perception difficulties in young children is one recently developed by Dr. Marianne Frostig and her associates. The Frostig Developmental Test of Visual Perception, 3rd Edition (1964), measures five distinct perceptual areas: perception of position in space, perception of spatial relationships, perceptual constancy, visual-motor coordination, and figure-ground perception. It has been standardized for use with children ages three years-six months through seven years-eleven months (Frostig and others, 1964). The Frostig instrument was selected as the final screening instrument in this study because of its comprehensiveness and its applicability to children of kindergarten age.

Of course, any of the aforementioned instruments can also be used for individual diagnosis, and often are. One of the newer techniques for individual assessment requires a series of observations of pupil responses to challenges posed by certain large muscle tasks. These were developed by Kephart (1960) who maintains that certain manifestations of visual-motor imbalance are indicative of the presence of perceptual handicaps which may affect the acquisition of reading skills.

Certain portions of other standardized tests have been found to have value for diagnosis of perceptual defects. The diamond copying task on the Stanford-Binet and the Performance Tests on the Wechsler Intelligence Scale for Children have been used as measures of perceptual ability in a number of studies (Strauss and Kephart, 1955). Recently, the Illinois Test of Psycholinguistic Abilities has been finding favor as a diagnostic instrument (McCarthy and Kirk, 1961).

Training Programs for the Perceptually Handicapped

Therapy for the perceptually handicapped child was largely a trial and error affair until Grace Fernald (with Helen Keller) devised a complete instructional system based on the sense of touch (1921). In the Fernald program, the child traces his own words and sentences until he can produce them automatically. Adaptations of the Fernald method remain in use today with kinaesthetically-oriented learners, but the technique is insufficient for treating the total range of perceptual disabilities.

A growing number of optometrists also are experimenting with various perceptual training methods, but these are confined largely to individuals. Dr. Marguerite Eberl (in Robinson (ed.), 1955) has produced a collection of case studies purporting to document the efficacy of visual training in correcting faulty perception. Getman (1959) also claims improved perception related to reading skills can be achieved in individual cases through training which includes strengthening the abilities of ocular pursuit, binocular fixation, accommodative rock, attention maintenance, depth perception and peripheral scan.

Shifting the training emphasis from the strictly ocular to the large muscle motor activities, Delacato's methods stress cross-pattern crawling, sleep posturing and training in laterality (1963). Although Delacato claims that his training program results in superior benefits for the perceptually handicapped child, evidence in the form of controlled studies is absent (American Academy of Pediatrics, 1966).

Spache (1963) describes a template training procedure which has been in use continuously since 1959 in the Winter Haven, Florida schools. This method makes use almost exclusively of geometric templates which children repeatedly trace. The rationale underlying this program is that the ability to reproduce forms is highly related to school achievement. Therefore, it is claimed, strengthening this skill will result in improved school performance. Attempts at verifying this proposition have yielded inconclusive results. Even though groups using the templates nearly always outscore comparison control groups on standardized reading achievement tests, seldom have these results been statistically significant.

The perceptual training techniques may be more effective in improving reading skills than conventional remedial reading materials was demonstrated by Halgren (1961). Two equivalent classes of ninth graders taught by the same teacher were compared on achievement and intelligence tests before and after training. One class received practice in eye-movements, tracing and tachistoscope exercises. The other group worked with materials from a commercial individualized remedial reading kit. At the end of the training period, the visual-perceptual group surpassed the conventional group significantly, both in reading achievement achievement gains and intelligence score increases. However, no attempt was made to control novelty effects or to account for differences that might have been caused by the fact that each group received instruction during a different part of the day.

Whether these findings also are applicable to the treatment of perceptually handicapped young children was tested by Cox and Hambley (1961). In a carefully designed experimental study they found that perceptual training involving binocular vision skills contributed markedly to accelerated development of reading achievement at both the primary and the junior high school levels. Their conclusions could be accepted more readily had not their experimental mortality rate exceeded 50 percent.

An attempt at developing a procedure for group treatment of individually-diagnosed visual perception handicaps is provided in a program developed by Marianne Frostig and associates (Frostig and Horne, 1964). In this program, worksheet exercises are provided which give practice in perceptual deficiencies identified by the Frostig Developmental Test of Visual Perception (Frostig and others, 1964). The Frostig program needs to be evaluated in a context which avoids the chance of interaction effects between the author's identification measure and her training program. The possibility exists that Frostig training methods are irrelevant for developing reading readiness skills in areas other than those identified by the Frostig test.

The methods adopted for use in this study, however, are those advocated by Newell Kephart in his text, The Slow Learner in the Classroom (1960). These procedures were selected because of their apparent effectiveness in improving the reading readiness ability of perceptually handicapped children of normal vision as reported by McBeath (1966).

In the Kephart program, emphasis is placed on the matching of sensory stimuli with motor activity, for Kephart reasons, "the eye must give the child the same information his motor reactors do" (1964, p. 204).

This reasoning is an extension of Allport's theory of perception. Allport calls our attention to the fact that "though we are accustomed to think of perception as the organization of sensory experience, a little thought will show that the muscular contractions which play a part in sensory accommodation and in general bodily adjustments to the object must be important" (1955, p. 183). Kephart asserts that children need to learn motor skills as an automatic response so that they can focus their attention on the purpose of what they do, rather than the mechanics. He points out that the child who must struggle unaided to make sense out of the arrangement of printed words and letters has little hope of getting any meaning from his reading. In arguing against the too-early use of symbolically-oriented materials in typical reading programs, Kephart conjectures that "... perhaps our preoccupation with symbolic variables has blinded us to the more fundamental problems of children.... Greater attention to the child's methods of handling the mechanics of our [imposed] tasks might result in less frustration for us and more learning for the child" (1964, p. 206).

To facilitate visual-motor coordination, Kephart recommends practice in balancing, ocular pursuit, chalkboard training and form duplication.

Recent investigations in animal behavior supports Dr. Kephart's advocacy of the inclusion of such activities. A breakthrough study by Rosenzweig and associates (Rosenzweig and others, 1960; Krech and others, 1962; Rosenzweig, 1966) verified the fact that certain kinds of perceptual training lead to brain changes and superior performance in rats. They concluded that "... when animals are given heightened experience in balancing, climbing, and the manipulation of objects, there is observable brain growth, especially in those areas having to do with bodily sensitivity.... By administering certain types of training one can actually induce growth in specific regions of the brain" (Levy and Howe, 1966). If this observation is also applicable to human learning, then Kephart's methods might hold some promise for the rehabilitation of perceptually handicapped children.

Partial substantiation of this idea is contained in studies reported by Boger (1952) and Waldner (1966), in which children's intelligence scores improved after Kephart-type training. The results would be more convincing if Boger instead of using one intact classroom group had selected his subjects at random from among several classes; and if Waldner had used parallel comparison control groups rather than relying on post-training measures of the actual performance of one group against the expected performance of the same group.

Importance of Vision in Perception

According to Barsch (1964), the child's sensory organs develop according to his survival needs at his particular stage of development. He therefore uses the information-getting mechanisms which secure adequate behavior patterns to meet these needs. In normal order of development they include the gustatory, olfactory, tactual, kinaesthetic, auditory, and visual senses. Together, the senses provide the information which is essential to the perceptual process.

The most complex of the senses is vision. Vision has been called "the core of the perceptual world" (Strauss and Kephart, 1955, p. 79). Gesell's investigations have prompted him to declare that the eye "embraces enormous area of the cerebrum; it is deeply involved in the autonomic nervous system; it is identified reflexively and directively with the skeletal musculature from head and hand to foot" (1941, p. vi). He goes on to state that "human visual perception ranks with speech in complexity and passes through comparable developmental phases" (ibid., p. 10).

It is estimated that a child depends upon his vision for 75 to 80 percent of his learning (Apell, 1957). A study by Sister Harrington (1953) called attention to the primacy of visual mechanisms in learning. She found that visual discrimination augmented by auditory perception was a greater influence than intelligence in determining the amount of a child's reading achievement.

After conducting numerous tests and reviewing scores of laboratory experiments in visual perception, Hunt concludes: "... a background of primary visual learning is apparently necessary before visual discriminations can be acquired" (1961, p. 96).

The focus of this study is on one of the measures of visual efficiency, visual acuity, and its possible interaction with training activities for the perceptually handicapped child.

The Relationship of Socio-Economic Status to Perceptual Handicaps

Recent impetus given by the United States Office of Education to the study of problems of educating the culturally disadvantaged child has resulted in the compilation of evidence to indicate that a definite relationship exists between socio-economic status and perceptual adequacy (Bloom and others, 1965). Children living in impoverished surroundings have startingly high rates of perceptual disabilities.

Among the studies reporting effects of stimulus deprivation are those by Forgus (1954) and Gibson (1956) who found that rats raised in a stimulating environment showed much more skill in discrimination tasks than their littermates raised in visually sterile surroundings. Jensen (1963) reports results of an experiment which indicated that learning was more rapid for a group which received both visual and tactile experiences than either one alone.

Covington's research (1962) showed that differences in perceptual ability are likely to exist between children coming from varying social classes. He reported that after comparing pre-test and post-test scores on a visual discrimination measure that lower status groups profited most from training which gave opportunity for securing familarity with stimulus objects. It should be pointed out, however, that the upper status groups were near their maximum performance level at the start of the experiment.

Deutsch decries the lack of variety of visual, tactile, and auditory stimulation in the homes of the culturally disadvantaged. He recommends "emphasis on perceptual training in the early school or pre-school years..." (in Passow (ed.), 1963). Casler's review of the literature (1961) results in the conclusion that perceptual deprivation is a cause of intellectual malfunctioning.

Organic factors influencing retarded perception in disadvantaged children were found by Pasamanick and Knobloch (1958). They found apparent connections between the high incidence of pregnancy and birth complications found in low socio-economic groups and the prevalence of perceptually-based reading disabilities of school children in those groups.

In validation studies of a reading prognosis test, Weiner and Feldman (1963, p. 814) concluded that "skill deficiencies underlying reading can be measured in children from any socio-economic group before reading instruction begins."

Effects of other programs for low socio-economic status children which include perceptual training are reported by Braziel and Terrell (1962), Gray and Klaus (1963) and Weaver (1965).

Braziel and Terrell found significant differences on reading readiness tests in favor of an experimental first grade group which was exposed to a program which included perceptual training. However, the program also included parent meetings, educational television and other readiness skills so the specific effects of perceptual training alone could not be measured.

The Early Training Project of Gray and Klaus took culturally disadvantaged children beginning at age 3-1/2 and provided home contacts plus two summer sessions of training in language, perception and concept formation skills. I.Q. test scores for this group went up while scores for control groups went down over the same period of time. In the same project, but with other children, Weaver found significant differences in overall language development as measured by the Illinois Test of Psycholinguistic Abilities. In both of the Early Training Project studies it was not possible to isolate the effects of perceptual training so it is not known which of the independent variables, singly or in combination were responsible for the results.

Consideration of socio-economic status in this study is justified by the number of citations in the literature which suggest a relationship between the young child's perceptual adequacy and his socio-economic status.

CHAPTER III

RESEARCH DESIGN

Objectives

The child with inadequate visual perception is nearly always handicapped to the extent that all his school subjects which involve reading are affected adversely. Cumulative school failures make remediation measures difficult, costly and frustrating.

Recognition of the preventability of visual perception disorders which manifest themselves in specific reading disabilities has led to the development of programs for the identification and training of the perceptually handicapped child. However, training which is apparently successful with some perceptually handicapped children nevertheless fails to benefit others (Axline, 1947). When in addition to his perceptual handicap, a child also has an organic functional impairment (such as defective vision), or a cultural handicap (such as an impoverished experiential background), his learning problems may be compounded.

More knowledge is needed concerning the effectiveness of specific training activities with children who exhibit different combinations of learning disabilities. Accurate diagnosis of learning disorders which accompany recognized perceptual dysfunction, followed by the application of specific remedial measures, should lead to more effective preparation of perceptually handicapped children for beginning reading.

General Purpose

The general purpose of the study was to determine the interaction effects of vision and perceptual training on the reading readiness of perceptually handicapped kindergarten pupils.

Specific Purposes

The study was designed specifically to measure the effects of training in large muscle coordination and eye movements (as recommended by Newell Kephart) on the reading readiness of perceptually handicapped kindergarteners who differ in visual acuity.

Pupils in this study were designated "perceptually handicapped" if their quotient on the Marianne Frostig Developmental Test of Perception, 3rd Edition (1964) placed them at or below the 30th percentile of the national standardization sample. In this study, perceptually handicapped children whose visual acuity rating for either eye was 20/30 or poorer in a Modified Clinical Technique (Blum and others, 1959) examination were considered to have "poor vision." Those with 20/25 ratings or better in both eyes were considered to have "good vision." Selected sub-tests of the Ginn Pre-Reading Test (McCullough and Russell, 1961) and the Lee-Clark Reading Readiness Test (Lee and Clark, 1962) were used as criterion measures of reading readiness.

Supplementary Objectives

Two additional objectives were considered, as follows:

1) To assess possible interaction effects of socioeconomic status with the training program and vision, the

dimension of social class was incorporated into the design of the major study. A modification of Warner's Index of Status Characteristics (1949) was used as the classification device.

2) To determine if there were possible effects of training on pupils with normal perception, the major study was extended to include a contrast group of kindergarten pupils who demonstrated normal perception and also varied in visual acuity.

Hypotheses

The central hypothesis tested in this study was as follows:

> The interaction effects of Kephart-recommended training and visual acuity are such that after receiving Kephart training, perceptually handicapped kindergarteners who have normal vision will be significantly better prepared for reading than those with poor vision.

It was conjectured, therefore, that Kephart training would significantly improve the reading readiness of perceptually handicapped children with normal vision, but would have little effect on those with poor vision.

The supplementary objectives concerning possible interaction effects of training, vision, and socio-economic status, and the effects of training on non-perceptually handicapped children led to the testing of two more hypotheses as follows:

1) After receiving Kephart training, perceptually handicapped kindergarten pupils of average and high socio-economic status who differ in visual acuity will be better prepared for reading than similar children of lower socio-economic status who also receive such training.

The assumption underlying this hypotheses is that the child of higher socio-economic status already has accumulated other advantages associated with reading readiness and that perceptual training alone will be insufficient compensation for the child of low socio-economic status.

2) After receiving Kephart training, kindergarten pupils who have normal vision perception and normal visual acuity will be better prepared for reading than similar children with poor visual acuity who also receive such training.

Procedural Strategy

In carrying out the objectives of the major study, procedures were followed which were intended to:

a) Identify the perceptually handicapped kindergarten children in a representative school district and assess their visual acuity.

b) Provide systematic training activities in perception for approximately half of those so identified.

c) Compare the relative effects of training and absence of training upon the reading readiness of perceptually handicapped kindergarteners who differ in visual acuity.

To carry out the supplementary objectives, it was also necessary to

a) Classify children in the study by socio-economic status and analyze results accordingly.

b) Identify and assign to treatment groups some kindergarten children who differed in visual acuity but were not perceptually handicapped.

General Design of the Major Study

To test the hypothesis of the major study, a factorial design was established, as represented in Figure 1.

Figure 1

Design of the Major Study as Originally Proposed

	Kephart Training	Control
Good Vision	15 pupils	14 pupils
Poor Vision	17 pupils	12 pupils

This arrangement permitted analysis of the interaction effects of training with visual acuity characteristics. Random assignment of experimental and control subjects was effected by placing the names of all eligible subjects on cards, turning the cards face down, selecting one name at a time for placement in a treatment group, returning the card to the pack and shuffling the cards before the next name. This method is suggested by Walker and Lev (1953) to assure that all subjects have as equal a chance as possible of being selected. It was originally intended to have the experimental and control group membership identical in number. The necessity of having to establish training groups of nearly equal size at four schools which had different numbers of eligible subjects precluded this possibility, however.

The mean perceptual quotient and standard deviation for each of the randomly assigned original groups is given in Table 1.

Table 1

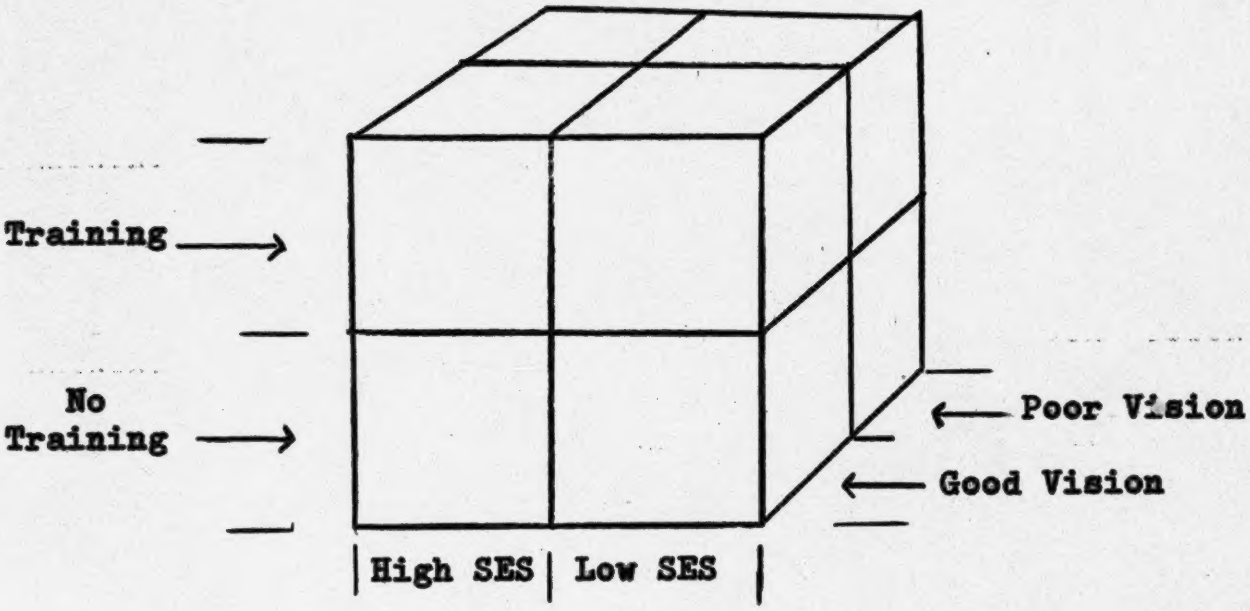
Mean Perceptual Quotient and Standard Deviation for Each Original Group

	Training -- Good Vision	Training -- Poor Vision	No Training -- Good Vision	No Training -- Poor Vision
Mean	82.40	83.00	80.64	83.00
Standard Deviation	6.48	7.67	7.08	7.26

After the establishment of the design represented in Figure 1, it became apparent that each cell contained two distinct groups of children with respect to socio-economic background. It appeared that the experiment might be slightly redesigned to extract some significant information concerning the interaction of socio-economic status with vision and training. A Chi-Square statistic was computed to determine if intercell differences were significant. No significance was found. Accordingly, without disturbing the original distribution of subjects in regard to main effects, the cells were further subdivided to include the socio-economic status dimension. This resulted in a 2x2x2 factorial design, represented in Figure 2.

Figure 2

2 x 2 x 2 Analysis of Variance


Training
No Training
Poor Vision
Good Vision
High SES
Low SES

The resulting distribution yielded the number of subjects in each treatment group shown in Table 2. The total number of children in column 1 of Table 2 was reduced by one since a subject in the original study moved away before completion of the experiment.

Table 2

Final Number of Children in Each Treatment Group of the Major Study

	Kephart Training		Control		
	Good Vision	Poor Vision	Good Vision	Poor Vision	Totals
High SES	8	12	6	7	33
Low SES	6	5	8	5	24
Totals	14	17	14	12	57

Design of the Study of Training Effects on Pupils with Normal Perception

To analyze the effects of Kephart training on non-perceptually handicapped pupils, an analysis of variance in a 2 x 2 design (Figure 3) was done with a small sample of pupils who had a Frostig perceptual quotient at or above 96 (40th percentile). The same identification tests, treatment conditions and criterion measures of the major study were applied to this group. Table 3 represents the mean perceptual quotient for each treatment group.

Figure 3

Design of the Study of Pupils with Normal Perception

	Training	Control
Good Vision	7 pupils	5 pupils
Poor Vision	4 pupils	5 pupils

Table 3

Mean Perceptual Quotient for Each Treatment Group
of the Study of Pupils with Normal Perception

	Training Good Vision	Training Poor Vision	No Training Good Vision	No Training Poor Vision
Number	7	4	5	5
Mean	101.00	100.80	108.80	102.80

Identification Instruments and Procedures

Perception Testing

Kindergarten children with perceptual handicaps were identified by the successive application of two visual perception tests.

Initially, a simple screening device, the Perceptual Forms Test (1965) was administered during February 1966 to all kindergarten children in the Mountain View School District, Mountain View, California who were present at school on the days the tests were given. The Perceptual Forms Test provides a simple assessment of visual-perceptual-motor coordination. Pictures of geometric forms are presented which children are asked to copy or complete. Since only the copying section has been empirically scaled, only that section was used.

Austin (in Buros (ed.), 1965, p. 1137) describes the test as being "helpful in evaluating the perceptual ability of school beginners." She bases her opinion on a review of research studies which show a high correlation between low scores on the Perceptual Forms Test and subsequent low achievement scores in basic subjects which utilize these perceptual skills. It is pointed out that although the Perceptual Forms Test is a satisfactory group screening device for identifying children with suspected perceptual handicaps, it is not sensitive enough to permit classification of children according to degrees of perceptual ability.

A scoring scale, developed after analysis of more than 7,000 sets of children's drawings, assigns points for accuracy, organization, size relationship, and neatness of work. Extra points are awarded at graduated intervals to compensate for age differences. Scores below 60 are considered to be indicative of future difficulties in general school achievement.

Accordingly, children who earned a score of 59 or less (a No. 1 Rating) were retested with a more comprehensive instrument, the Marianne Frostig Developmental Test of Visual Perception, 3rd Edition (Frostig and others, 1964). The Frostig Test measures such skills as perception of position in space, perception of spatial relationships, perceptual constancy, visual-motor coordination, and figure-ground perception. In its 1963 standardization, 2116 children ranging from three to nine years of age were included. Split-half reliability correlation coefficients for the five subtests range from .35 to .96 depending upon the age of the subjects. Total score reliabilities range from .78 to .89.

The Frostig Test yields a Perceptual Quotient derived in a manner analogous to the Stanford-Binet Intelligence Quotient. Children with a Perceptual Quotient of 92 (the 30th percentile of the standardization sample) and below were arbitrarily designated as perceptually handicapped for purposes of this study.

The Perceptual Forms and Frostig Tests were administered in small groups not exceeding ten pupils. The testing was conducted by the research director and by two certified elementary and nursery school teachers who first received training in the administration of these tests. The training included practice in the administration of tests with pupils of similar age who were not in the study.

Vision Testing

All perceptually handicapped children in this study (plus a contrast group of non-handicapped children) were given comprehensive vision examinations by a professional optometrist assisted by school nurses. Procedures used were those of the Modified Clinical Technique, a screening method by which children in a relatively short time can be accurately tested for defects in visual acuity, refraction, coordination, and color discrimination. In a comprehensive comparative research project (Blum and others, 1959), the Contra Costa County Optometric Society studied seven different vision screening methods. The Modified Clinical Technique was found to be the most efficient. It had the most correct referrals (90 percent) and the least number of under and over-referrals. Its reliability coefficient was .93.

Since children of kindergarten age have a tendency to be farsighted (Eames, 1953), a visual acuity score tending to nearsightedness (20/30 or worse in either eye) was selected as the criterion for "poor" visual acuity. The optometrist who did the testing made individual evaluations of scores of coordination and refractive error, although there were too few of these to use as criteria of visual performance in this study.

Classification by Socio-Economic Status

Classification of children in the study according to socio-economic status was accomplished through a modified Warner's Index of Status Characteristics (1953). Since children from most severely disadvantaged segments of the local population made up nearly half the membership in this study, it was decided to establish only two categories of social stratification: high and low. Following Warner's criteria, each child's father's occupation and residential dwelling was rated separately on a five-point scale from 1 (highest) to 5 (lowest). Those children whose scores totaled 9 or 10 were designated low SES. All others in the study were designated high SES.*

The Independent Variable

The independent variable was a program of training activities in perception based on those presented in Kephart's The Slow Learner in the Classroom (1960). Treatment consisted of daily exercises in large muscle coordination and eye movements. Typical activities included work with balance boards, walking beams, Marsden balls, stick figure tracing, ocular pursuit exercises, chalkboard training, and games requiring arm and leg coordination. Two recommended activities which were not included were trampoline work and pegboard exercises, the former because of technical difficulties and the latter because of lack of time.

Children receiving training were assigned to groups ranging in size from four to seven pupils. Training was conducted for fifteen minutes a day, each school day for eight weeks, excluding holidays and days of teacher institutes. The training began on March 14, 1966 and continued through May 6.

All nine of the Mountain View School District kindergarten teachers administered Kephart training for some portion of the project period. Before working with pupils in the study, each teacher received three hours of orientation and training in Kephart methods by the project director and Dr. Marcia McBeath. The teachers worked from a standard set of daily lesson plans (see Appendix A) designed to keep treatments constant. One teacher would administer the training to an assigned group alone in the classroom while the children not in the experimental group were out of the room under the supervision of another kindergarten teacher.

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*A description of residential and occupation categories and the frequency distribution of pupils by socio-economic status are shown in Appendix D.

Training materials and counsel were provided by the project director who visited each teacher at least once a week during the training period.

Population Characteristics

Pupils enrolled in the 18 kindergarten classes of the Mountain View School District, Mountain View, California made up the population from which the samples in this study were drawn.

Kindergarten children were selected as subjects for the study since they represent a sizable pre-reading group from the general population which is conveniently available for identification, testing, and training. In line with the objective of finding and assisting perceptually handicapped pupils before they encounter the pressures of formal reading programs, the kindergarten group seemed an ideal one to utilize.

Five hundred and two kindergarteners were enrolled at the start of the study. During the 1965-66 academic year, Mountain View School District's total elementary school enrollment averaged 3500 pupils in Kindergarten through Grade 8.

Although Mountain View is essentially a suburban residential community, agriculture, industry, retail businesses, military installations and research facilities all play a role in the local economy. The residents of Mountain View represent diverse ethnic groups, income levels and occupations.

Four schools in Mountain View School District conducted kindergarten classes during the 1965-66 school year. Two of the schools have high concentrations of children whose parents are Mexican-American farm laborers or unskilled workers. The remaining two schools have a slight majority of children whose parents represent the professional-managerial category of occupations. However, an extensive socio-economic range is found at each school in the district.

Derivation of Sample used in the Major Study

Of the 502 kindergarten pupils enrolled in Mountain View School District in January 1966, 456 were present for screening with the Perceptual Forms Test.

Number 1 Ratings (Scores of 59 or below) on the Perceptual Forms Test were found for 144 pupils. Of these, 128 were present for testing in small groups with the Frostig Developmental Test of Visual Perception. Fifty-eight of these children earned a Perceptual Quotient equal to or less than 92 (30th percentile of the national standardization sample). All of these children were examined by an optometrist for vision defects. Visual acuity defects of 20/30 or worse in either eye was found in 29 cases.

A summary of the sample derivation appears in Table 4.

Table 4

Number (N) of Subjects at Each Level of Sample Derivation for the Major Study

Description	N
Kindergarten Population at Start of Experiment	502
Perceptual Forms Tests Administered	456
Perceptual Forms Tests Results with No. 1 Rating	144
Frostig Tests Administered	128
Frostig Results at or below PQ 92 (Major Study Sample)	58
Vision Tests Administered to Perceptually Handicapped	58
Visual Acuity Cases at or Worse than 20/30	29

The Dependent Variable

Effects of training were measured by analysis of the results of selected subtests of the Ginn Pre-Reading Test (McCullough and Russell, 1961), and the Lee-Clark Reading Readiness Test (Lee and Clark, 1962).

In the Ginn Pre-Reading Test, Part 3 -- Visual Readiness was administered to all experimental and control subjects. All four tests of the Lee-Clark instrument also were administered, although only Test 1 (recognition of similarities in letters), Test 2 (recognition of differences in letters), and Test 4 (recognition and differentiation of letters and word symbols) were designated criterion measures.

These particular sub-tests were selected as criterion measures because they closely approximate the kinds of word and letter identification tasks which children encounter in typical first grade reading programs. Other portions of these tests measure symbol and concept understandings which are related to but are not identical to the task of perceiving actual words and letters.

The Ginn Pre-Reading Test is a quasi-standardized measure which according to the manual (McCullough and Russell, 1961, p. 3) is based upon the performance of 600 children in first grades distributed through thirteen geographical locations in the United States. It identifies children by quartiles of reading readiness for the Ginn reading textbook series. Since this series is one of the predominantly used in the first grades of the school system from which the sample of subjects was drawn, the Ginn Pre-Reading Test seemed a particularly appropriate measure of reading readiness for graduating kindergarteners in that district. Part III -- Visual Readiness presents the child with a series of words arranged in groups of three, two of which are the same. He is asked to mark the word that is different.

The Lee-Clark Reading Readiness Test is a more carefully standardized instrument with high reliability and validity. It features a high ceiling and yet is short enough to maintain the interest of most kindergarteners. The Lee-Clark Manual (Lee and Clark, 1962, p. 678) reports reliability coefficients for the total test ranging from .87 to .96. Sub-test reliabilities are listed as:

Part I -- Letter Symbols (Tests 1 & 2) -- Coefficient of .88

Part III -- Word Symbols (Test 4) -- Coefficient of .86

Part II (Test 3 -- Concepts) which was administered but was not designated as a separate criterion measure, has a reliability coefficient of .52.

Test 1 of the Lee-Clark requires children to match identical letters by drawing lines between them. In Test 2, children are asked to choose among four letters placed on a series of lines and cross out the letter that is different on each line. The final criterion measure, Test 4, presents sample letters and words one at a time and asks pupils to mark letters and words on each line which are identical with the sample.

Statistical Procedures

All hypotheses of the study were tested statistically by analysis of variance of the scores of pre-selected reading readiness sub-tests. Differences were considered significant if the .05 confidence level was achieved.

Computations of the F-Statistic were based on formulae and procedures recommended by Winer (1962). Since the number of cases varied from group to group, unweighted means analysis formed the basis of calculations to determine significance. In the unweighted means analysis, each group is treated as a unit by averaging the scores of individual members. Lindquist (1956) calls this "The Group as the Unit of Analysis."

Effects of possible heterogeneity of variance were considered because of the presence of some scores which deviated markedly from the cell mean. Although the F-statistic is considered relatively robust (Winer, p. 239) with respect to heterogeneity, it was decided to analyze the simple effects of variables for those groups which had very large variances, and whose interaction effects between two or more variables appeared significant. Box's Approximate F-Tests for Heterogeneous Samples (1954) served as a check against the conventional procedures employed.

Measures of intervariable correlation and the statistical accumulation of information used in the study were obtained by processing the data through established Fortran programs using an IBM 7090 computer.

CHAPTER IV

RESULTS AND DISCUSSION

Results of the Major Study

Results were compared for each of the perceptually handicapped treatment groups* by means of three-way analysis of variance for each of the criterion measures.**

Results of Analysis

Criterion measures of reading readiness included the raw scores of the Ginn Pre-Reading Test, Test 3 and selected sub-tests of the Lee-Clark Reading Readiness Test.

The Ginn Pre-Reading Test consists of five sub-tests. For reasons mentioned in Chapter III (pp. 39-40), only Test 3, Visual Readiness, was chosen as a criterion measure from this battery. This test purports to measure the ability to recognize similarities and differences in word symbols (McCullough and Russell, 1961, p. 5). Table 5 lists the mean for each treatment group on Test 3.

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*The frequency distribution of Perceptual Quotients for each of the treatment groups in the major study is presented in Appendix B-1.

**Raw scores for the criterion measures are listed in Appendix C-1.

Table 5

Means for Treatment Groups on Test 3 of the Ginn Pre-Reading Test

(Recognition and Differentiation of Word Symbols)

	TRAINING		CONTROL	
	Good Vision	Poor Vision	Good Vision	Poor Vision
High SES	10.25	9.83	8.67	11.43
Low SES	10.00	6.60	9.38	7.40

A summary of analysis of variance on this criterion is reported in Table 6.

Table 6

Three-Way Analysis of Variance for Ginn Test 3

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F
Training	.66	1	.66	NS
Vision	7.66	1	7.66	NS
Socio-Economic Status	38.27	1	38.27	2.13
Training-Vision	17.45	1	17.45	NS
Training-SES	.00	1	.00	NS
Vision-SES	49.18	1	49.18	2.74
Training-Vision-SES	2.64	1	2.64	NS
Within Cells	880.48	49	17.97	
Total	996.34	56		

At 1 and 49 degrees of freedom, the following F statistics are required for significance:

At	1%	7.18
	5%	4.04
	10%	2.82

No significant difference can be assumed for training, vision, or socio-economic status, or interactions, with regard to the Ginn criterion measure. The degree of significance stated in the null hypothesis was .05.

In addition to Test 3 of the Ginn Pre-Reading Test, the entire Lee-Clark battery was administered to experimental and control subjects at the conclusion of the eight-week training period. Data is reported for each of the subjects and the total score of the Lee-Clark instrument even though only Tests 1, 2, and 4 were originally designated as criterion measures.

Test 1 of the Lee-Clark produced means for the various treatment groups as shown in Table 7.

Table 7

Means for Treatment Groups on Test 1 of the Lee-Clark Reading Readiness Test

(Visual Discrimination and Recognition of Similarities in Letter Symbols)

	TRAINING		CONTROL	
	Good Vision	Poor Vision	Good Vision	Poor Vision
High SES	7.13	7.33	7.17	6.57
Low SES	3.67	4.40	7.38	6.40

Test 1 "measures ability to discern similarities in letter forms" (Lee and Clark, 1962, p. 3). A summary of the analysis of variance for this measure is shown in Table 8.

Table 8

Three-Way Analysis of Variance for Test 1 of the Lee-Clark Reading Readiness Test

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F
Training	20.23	1	20.23	2.68
Vision	0.03	1	0.03	NS
Socio-Economic Status	32.79	1	32.79	4.35*
Training-Vision	4.89	1	4.89	NS
Training-SES	34.64	1	34.64	4.59*
Vision-SES	0.00	1	0.00	NS
Training-Vision-SES	.86	1	.86	NS
Within Cells	369.68	49	7.54	
Totals	463.12	56		

*Significant at .05.

The significant interaction between training and socio-economic status was further analyzed to discover the simple effects of training on pupils who differed in socio-economic status.

The F-statistic for training effects on the high socio-economic group was 1.98 (not significant). For the low socio-economic the F-statistic was 14.29, significant beyond the .01 level of confidence.

It appears from the foregoing analysis that Kephart training depressed the scores on this measure for low socio-economic status children and had no apparent effect on the other variables.

The next criterion measure, Test 2 of the Lee-Clark, "measures the ability to perceive differences in letter forms" (Lee and Clark, 1962, p. 3). Means for each of the treatment groups are reported in Table 9. Analysis of variance for Test 2 is reported in Table 10.

Table 9

Means for Treatment Groups on Test 2 of Lee-Clark Reading Readiness Test

(Visual Discrimination and Differences in Letter Symbols)

	TRAINING		CONTROL	
	Good Vision	Poor Vision	Good Vision	Poor Vision
High SES	10.13	11.33	8.50	10.71
Low SES	10.83	4.40	10.25	6.40

Table 10

Three-Way Analysis of Variance for Test 2 of the Lee-Clark Reading Readiness Test

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F
Training	.59	1	.59	NS
Vision	39.00	1	39.00	3.60*
Socio-Economic Status	63.85	1	63.85	6.05**
Training-Vision	10.58	1	10.58	NS
Training-SES	11.10	1	11.10	NS
Vision-SES	154.81	1	154.81	14.66***
Training-Vision-SES	.21	1	.21	NS
Within Cells	531.20	49	10.84	
Totals	811.34	56		

*Significant at .10.

**Significant at .05.

***Significant at .001.

From the preceding tables it can be seen that apparently Kephart training had no effect on the ability to perceive differences in letter forms. However, apparently scores were influenced by socio-economic status and visual adequacy. The influence of vision on this criterion measure is probable although the required level for significance was not obtained.

An analysis of the simple effects of the vision-socio-economic status interaction provided the following result:

Vision effects on High SES -- F = 3.54

Vision effects on Low SES -- F = 32.83*

From the foregoing it would appear that poor vision depressed the scores of this criterion measure for pupils of low socio-economic status, regardless of training.

Test 3 (Concepts) of the Lee-Clark was not one of the selected criterion measures (it does not test reading skills, per se), but is presented here as a matter of interest. Test 3 "measures each pupil's oral vocabulary, his understanding of concepts, his ability to follow directions, and his knowledge of meanings" (Lee and Clark, 1962, p. 3). Table 11 reports the means and Table 12 presents the analysis of variance for each of the treatment groups.

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*Significant beyond .001.

Table 11

Means for Treatment Groups on Test 3 of the Lee-Clark Reading Readiness Test (Concepts)

	TRAINING		CONTROL	
	Good Vision	Poor Vision	Good Vision	Poor Vision
Avg. SES	16.63	17.58	15.50	16.86
Low SES	15.67	15.20	15.50	13.00

Table 12

Three-Way Analysis of Variance for Test 3 of the Lee-Clark Reading Readiness Test

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F
Training	14.74	1	14.74	3.26*
Vision	.33	1	.33	NS
Socio-Economic Status	42.83	1	42.83	9.48***
Training Vision	2.18	1	2.18	NS
Training-SES	.20	1	.20	NS
Vision-SES	23.07	1	23.07	5.10**
Training-Vision-SES	4.89	1	4.89	NS
Within Cells	221.28	49	4.52	
Total	309.52	56		

*Significant at .10.
**Significant at .05.
***Significant at .01.

Once again, training effects failed to reach the required degree of significance (.05). It would seem, though, that the trend represented by the F-statistic here indicates that the Kephart training program may have had some effect on concept development as measured by this test. Mean Scores on Test 3 of the Lee-Clark Readiness Test were consistently higher for the experimental groups, and significance at the 10 percent level was achieved.

The influence of socio-economic status was evident here, with high status children achieving higher scores.

As with the previous criterion measure, interaction effects of vision and socio-economic status were analyzed with regard to simple effects. The following F statistics resulted:

Vision Effects on High SES -- F = 3.90*
Vision Effects on Low SES -- F = 6.45**

From the above F-statistics it can be inferred that vision is apparently related to the concepts scores of both high and low status pupils, but for low status pupils the relationship is more pronounced.

Test 4 "measures the ability to recognize similarities and differences in letter and word forms, from the most simple type of gross differences to complex and minute variations" (Lee and Clark, 1962, p. 3). Means for treatment groups with regard to Test 4 are given in Table 13, followed by a three-way analysis of variance for Test 4 which is reported in Table 14.

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*Significant at .10

**Significant at .05.

Table 13

Means for Treatment Groups on Test 4 of the Lee-Clark Reading Readiness Tests

(Recognition and differentiation of letters and words.)

	TRAINING		CONTROL	
	Good Vision	Poor Vision	Good Vision	Poor Vision
Avg. SES	10.13	12.00	14.17	12.43
Low SES	12.83	10.00	9.50	11.00

Table 14

Three-Way Analysis of Variance for Test 4 of the Lee-Clark Reading Readiness Test

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F
Training	3.77	1	3.77	NS
Vision	1.19	1	1.19	NS
Socio-Economic Status	24.13	1	24.13	1.07
Training-Vision	.47	1	.47	NS
Training-SES	38.21	1	38.21	1.69
Vision-SES	1.72	1	1.72	NS
Training-Vision-SES	46.14	1	46.14	2.04
Within cells	1107.49	49	22.60	
Total	1223.12	56		

Examination of the data in the foregoing tables indicates that neither main effects nor interactions among the variables were statistically significant for symbol recognition ability as measured by Test 4.

The Lee-Clark Reading Readiness total test score is the arithmetic sum of the preceding four sub-tests. Table 15 presents the means of the total test scores for the various treatment groups.

Table 15

Means for Treatment Groups on Total Score of the Lee-Clark Reading Readiness Test

	TRAINING		NO TRAINING	
	Good Vision	Poor Vision	Good Vision	Poor Vision
Avg. SES	44.00	48.17	45.33	46.57
Low SES	43.67	34.00	42.63	36.80

Table 16 shows the analysis of variance results for total scores of the Lee-Clark Reading Readiness Test.

Table 16

Three-Way Analysis of Variance for Total Score of the Lee-Clark Reading Readiness Test

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F
Training	1.85	1	1.85	NS
Vision	84.15	1	84.15	NS
Socio-Economic Status	600.98	1	600.98	6.57**
Training-Vision	.66	1	.66	NS
Training-SES	3.44	1	3.44	NS
Vision-SES	361.24	1	361.24	3.95*
Training-Vision-SES	37.88	1	37.88	NS
With cells	4485.51	49	91.54	
Total	9142.58	56		

*Significant at .10

**Significant at .05

Only the effect of socio-economic status was found to be significant on the Lee-Clark Total, with high SES subjects outscoring the low SES groups. Particularly low scores were obtained by low status pupils who also had vision defects. This was reflected in the Vision-SES interaction statistic which approached but did not reach the .05 level.

Main Effects of Training, Vision, and Socio-Economic Status

From the foregoing information, it must be concluded that under the conditions of the experiment, and with the sample of perceptually handicapped selected, neither training nor visual acuity demonstrated a consistent relationship to the reading readiness criterion measure of the study. The only variable to consistently demonstrate a relationship to the criterion measures was socio-economic status.

Kephart Training

The following summary (Table 17) compares the effect of training on the combined subjects in the experimental (N = 31) and control (N = 26) groups:

Table 17

Comparison of Means of the Criterion Measures for Combined Training Groups

Criterion Measure	Training Groups	Control Groups
Ginn #3	9.45	9.38
Lee-Clark #1	6.10	6.92
Lee-Clark #2	9.81	9.23
Lee-Clark #4	11.35	11.65
Lee-Clark #3*	16.58	15.38
Lee-Clark Total	43.81	43.19

*Significant at .10.

For only two of the four original criterion measures did the experimental group scores exceed those of the control group, and these were not statistically significant, as indicated by the preceding analyses.

Vision

Visual acuity differences did not seem to make any difference with regard to scores on the criterion measures. Table 18 illustrates the point. Twenty-eight subjects with normal visual acuity were compared with 29 subjects with poor visual acuity.

Table 18

Comparison of Means of the Criterion Measures for Combined Vision Groups

	28 Good Vision	29 Poor Vision
Ginn #3	9.61	9.24
Lee-Clark #1	6.46	6.48
Lee-Clark #2	9.96	9.14
Lee-Clark #4	11.46	11.59
Lee-Clark #3	15.86	16.21
Lee-Clark Total	40.11	43.38

Socio-Economic Status

Table 19 demonstrates the consistent relationship of socio-economic status to scores on the selected criterion measures. On every one of the measures, the 33 high SES subjects had higher mean scores than the 24 low SES subjects. Significance at the .05 level was found in the case of three criterion measures.

Table 19

Comparison of Means of the Criterion Measures for Combined Socio-Economic Status Groups

Criterion Measure	High SES	Low SES
Ginn #3	10.06	8.54
Lee-Clark #1	7.09	5.63
Lee-Clark #2*	10.39	8.38
Lee-Clark #4	12.03	10.75
Lee-Clark #3*	16.82	14.96
Lee-Clark Total*	46.30	39.71

*Significant at .05.

Discussion of Results of the Major Study

The major hypothesis relating to predicted higher post-training reading readiness scores for perceptually handicapped children with normal vision was not substantiated.

The findings fail to verify McBeath's ex post facto analysis (1966) in which she found that Kephart training apparently significantly improved the reading readiness of kindergarten children with normal visual acuity, but was of doubtful value with children with poor visual acuity. Except for a trend in the direction of significance in Test 2 (recognition of differences in letter symbols) and Test 3 (concepts), the training program in this study appeared impotent for the stated purpose with all vision groups. Particularly noteworthy is the fact that not a single criterion measure even approached significance for a training-vision interaction effect.

Possible explanations for this apparent discrepancy probably lie in the population differences of the respective samples or in the fact that McBeath's group was not randomly selected. McBeath's population had an inferred intelligence quotient of 108, based on test data for older siblings. The IQ median of this study's sample is not known, but it is assumed to be considerably lower since 42 percent of the children were of low socio-economic status. There is also the possibility that McBeath's sample or the sample under investigation here is unique.

The hypothesis concerning predicted higher reading readiness scores for the higher socio-economic status treatment groups was confirmed. Apparently factors related to socio-economic status not measured in this study were of greater influence than either training or vision.

Results of the Normal Perception Study

Results were analyzed to test the hypothesis that Kephart-recommended training would result in higher reading readiness scores for children with normal perception and normal vision. Subjects with perceptual quotients above 96 (40th percentile) on the Frostig Developmental Test of Visual Perception were deemed to have normal perception.* Visual acuity standards and readiness criterion measures** were identical to those applied to the perceptually handicapped groups.

Results of Analysis

Means for each treatment group of the normal perception study on Test 3 of the Ginn Pre-Reading Test are presented in Table 20. The analysis of variance for the main effects and the interactions of this test are given in Table 21.

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*Perceptual Quotient frequencies for the normal perception group are listed in Appendix B-2.

**Criterion measure raw scores for the normal perception group are listed in Appendix C-2.

Table 20

Means for Normal Perception Treatment Groups on Test 3 of the Ginn Pre-Reading Test

TRAINING		CONTROL	
Good Vision	Poor Vision	Good Vision	Poor Vision
11.57	12.50	11.40	13.20

Table 21

Two-Way Analysis of Variance for Test 3 of the Ginn Pre-Reading Test

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F
Training	.35	1	.35	NS
Vision	9.46	1	9.46	1.21
Training-Vision	.91	1	.91	NS
Within cells	146.71	17	8.63	
Totals	157.43	20		

At 1 and 17 degrees of freedom, the following F statistics are required for significance:

At 1%	8.40
5%	4.45
10%	3.03

Since neither treatment, vision, nor their interaction reached the required confidence level, no significant differences can be assumed for the Ginn criterion measure.

Table 22

Means for Normal Perception Treatment Groups on Test 1 of the Lee-Clark Reading Readiness Test

TRAINING		CONTROL	
Good Vision	Poor Vision	Good Vision	Poor Vision
7.86	10.50	8.00	7.00

Table 23

Two-Way Analysis of Variance for Test 1 of the Lee-Clark Reading Readiness Test

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F
Training	14.32	1	14.32	2.42
Vision	3.39	1	3.39	NS
Training-Vision	16.75	1	16.75	2.83
Within cells	101.86	17	5.91	
Total	136.32	20		

Once again it appears that the required degree of significance was not achieved for the variables in the study. The data indicates a trend in the direction of a relationship between training and poor vision.

Lee-Clark Test 2 (Letter Differences) means for each group are represented in Table 24. Analysis of variance for Test 2 is reported in Table 25.

Table 24

Means for Normal Perception Treatment Groups on Test 2 of the Lee-Clark Reading Readiness Test

TRAINING		CONTROL	
Good Vision	Poor Vision	Good Vision	Poor Vision
11.57	12.00	11.00	11.20

Table 25

Two-Way Analysis of Variance for Test 2 of the Lee-Clark Reading Readiness Test

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F
Training	2.38	1	2.38	NS
Vision	.51	1	.51	NS
Training-Vision	.05	1	.05	NS
Within cells	26.51	17	1.56	
Total	29.45	20		

On this measure of ability to discriminate letter differences, no significant differences were found.

On Test 3 (Concepts) of the Lee-Clark Reading Readiness no significance was found for main effects or interactions for the Normal Perception groups. Means are listed in Table 26, and the analysis of variance for Test 3 appears in Table 27. This fact contrasted with the results of the perceptually handicapped group's scores on the same test. In that group a trend was evident in the direction of indicating that training influenced results.

Table 26

Means for Normal Perception Treatment Groups on Test 3 of the Lee-Clark Reading Readiness Test

TRAINING		CONTROL	
Good Vision	Poor Vision	Good Vision	Poor Vision
17.86	16.75	17.60	16.40

Table 27

Two-Way Analysis of Variance for Test 3 of the Lee-Clark Reading Readiness Test

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F
Training	.45	1	.45	NS
Vision	6.78	1	6.78	1.80
Training-Vision	0.00	1	0.00	NS
Within cells	64.01	17	3.77	
Total	71.24	20		

Similar outcomes were found on Test 4 of the Lee-Clark instrument. Test results failed to differentiate significantly among treatment groups on this measure of ability to recognize similarities and differences in word and letter forms. Table 28 presents the means and Table 29 shows the analysis of variance for Test 4.

Table 28

Means for Normal Perception Treatment Groups on Test 4 of the Lee-Clark Reading Readiness Test

TRAINING		CONTROL	
Good Vision	Poor Vision	Good Vision	Poor Vision
15.29	16.00	15.80	15.00

Table 29

Two-Way Analysis of Variance for Test 4 of the Lee-Clark Reading Readiness Test

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F
Training	.30	1	.30	NS
Vision	.00	1	.00	NS
Training-Vision	2.88	1	2.88	NS
Within cells	182.23	17	10.72	
Total	185.41	20		

Although groups which received training received higher total Lee-Clark scores (Table 30), these differences were not significant at the required .05 level. Table 31 presents the analysis of variance for the treatment groups on Lee-Clark Total errors.

Table 30

Means for Normal Perception Treatment Groups on Total Test Scores of the Lee-Clark Reading Readiness Test

TRAINING		CONTROL	
Good Vision	Poor Vision	Good Vision	Poor Vision
52.27	55.00	52.40	49.60

Table 31

Two-Way Analysis of Variance for Total Test Scores of the Lee-Clark Reading Readiness Test

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F
Training	39.22	1	39.22	1.15
Vision	.15	1	.15	NS
Training-Vision	59.56	1	59.56	1.75
Within cells	578.40	17	34.02	
Total	677.33	20		

Discussion of Results

Failure of training or vision to significantly affect the reading readiness criterion measures indicates either that these independent variables are relatively unimportant in influencing the reading readiness of pupils with normal perception, or that some internal factors of the experiment were at fault.

On the basis of the results, the hypothesis must be rejected which predicted significantly higher post-training reading readiness scores for kindergarten pupils with normal perception and normal vision.

Higher mean results on five of the six subtest for the poor vision training group compared to their good vision counterparts is in direct conflict with McBeath's findings (1966) that Kephart training improved the reading readiness of normal vision children but had no salutary effect on poor vision subjects. This suggests that for this sample, some other variable, such as intelligence, may have had a greater effect on reading readiness than either training or vision.

CHAPTER V

SUMMARY AND IMPLICATIONS

Problem and Procedures

The study was undertaken to determine the effects of a reading readiness training program for perceptually handicapped kindergarteners who differed in visual acuity. Concurrent investigations were made of the interaction of effects of socio-economic status with training, and the effects of training on pupils with normal visual perception.

In this report, visual perception was defined as "the process of giving consistent and accurate meaning to that which is observed." It is generally considered to be a learned phenomenon. Perceptually handicapped children are those who do not consistently and accurately interpret what they see, particularly with reference to identifying printed letters and words.

Visual acuity, on the other hand, was defined as a measure of organic ability to discriminate small variations in form at prescribed distances. Defects in visual acuity typically are correctable by using properly fitted lenses.

Children who were perceptually handicapped were identified by the use of two screening instruments administered successively. The Perceptual Forms Test first was administered to all kindergarten children who were present in the Mountain View School District (N = 456) during February, 1966. Those receiving a raw score of 59 or below (N = 144) were retested with the Frostig

Developmental Test of Visual Perception. Any child testing at the 30th percentile or below on the Frostig Test was designated perceptually handicapped for the purposes of this investigation. Fifty-eight children were so designated. The perceptually handicapped children plus a small contrast group of children with normal perception (N = 21) were screened for vision defects by means of the Modified Clinical Technique. Those pupils whose visual acuity in either eye tested 20/30 or worse were considered to have poor vision. The rest were considered to have good vision. In the major study, 29 subjects had good vision and 29 had poor vision. In the study of children with normal perception, 12 had good vision and 9 had poor vision.

Perceptually handicapped children and the small contrast group of children with normal perception were randomly assigned to experimental and control groups. In the major study, each experimental group was compared with a control group of equivalent vision and socio-economic status. In the study of children with normal perception, only vision and training were considered.

Each child in the experimental group received 15 minutes a day of training in large muscle coordination and eye movements as prescribed by Kephart. Children in the control groups received no special treatment. Kindergarten teachers administered the training to children in small groups. Detailed daily lesson plans and materials were provided to keep treatments constant. Training continued over eight weeks of school from March 14 through May 6, 1966.

Following the training period, the Ginn Pre-Reading Test, Part 3 and the entire battery of the Lee-Clark Reading Readiness Test were administered as criterion measures to all children in the study. Results of each of the sub-tests and the total score of the Lee-Clark test were analyzed to verify the following hypotheses:

(1) The interaction of Kephart-recommended training and visual acuity are such that after receiving Kephart treatment, perceptually handicapped kindergarteners who have normal vision will be significantly better prepared for reading than those with poor vision.

(2) After receiving Kephart training, perceptually handicapped kindergarten pupils of average and high socio-economic status who differ in visual acuity will be better prepared for reading than similar children of lower socio-economic status who also receive such training.

(3) After receiving Kephart training, kindergarten pupils who have normal visual perception and normal visual acuity will be better prepared for reading than similar children who have normal visual perception and poor visual acuity who also receive such training.

Results

The central hypothesis which predicted that training in large muscle coordination and eye movements would result in a reading readiness advantage for perceptually handicapped children with normal visual acuity was not borne out by the study. Such children surpassed neither those with poor vision nor their equivalent control groups.

There was no substantiation for the supplementary hypothesis relating to socio-economic status. Analysis of the results indicated that the training program was apparently irrelevant, since the high status experimental and control groups surpassed their low-status counterparts by proportionate margins.

The third hypothesis relating to predicted benefits of Kephart-training for children with normal perception and normal vision was not substantiated. There were no significant differences on any of the criterion measures between non-perceptually handicapped children with good vision and those with poor vision.

Certain trends were observed, however. In one test of recognition of differences in letter symbols and in a test of concepts related to beginning reading, Kephart training appeared to have exerted a salutary influence, significant at the .10 level.

The major conclusion to be derived from the results is that factors associated with socio-economic status apparently are of more significance in determining the reading readiness level of perceptually handicapped kindergarteners than either visual acuity or Kephart training.

Limitations

There are several limitations which may have affected the results. Some have to do with the design of the study and some are associated with field conditions which were unexpectedly encountered.

Screening Instruments and Procedures

The Perceptual Forms Test which was employed as the preliminary screening instrument was standardized with "school beginners" who ranged in age up to a year older than the group represented in this study. In this study, scores for children under six years of age were obtained by extrapolation of the scoring scale provided in the test manual. Hence, it is possible that some errors in preliminary classification could have been made with very young subjects. While this could not have affected the results directly (children identified by the Perceptual Forms Test were screened a second time with another instrument), it did limit the effectiveness of the initial screening device. More than twice as many children were identified as perceptually handicapped in the first screening as in the second.

The carefully standardized Frostig instument which was used as the final screening measure for perceptual adequacy, was limited by the fact that it had been validated on a predominantly middle-class population. Forty-two percent of the children in this study were of low socio-economic status. During Frostig testing, some children appeared to have difficulty understanding the directions. This may have been caused either by low intelligence or inability to understand directions in the English language. The Frostig Test, for some children in the group tested, may have been more a measure of intelligence or understanding of spoken English than of perceptual adequacy.

Even though the examiners carefully rehearsed their procedures, testing conditions varied greatly from school to school. In most cases it was possible to test the recommended limit of ten pupils at a time. In other cases, space could not be made available for the testing of more than four of five. In the case of make-up tests, sometimes a single child would be examined. It became obvious to the examiners that despite their efforts to standardize test administration procedures, the children in the smaller groups did receive more attention. Their scores may be spuriously high in relation to the children tested in larger groups.

Duration of Treatment

It may very well be that the training period (eight weeks) was too short to expect differences to register, even though Covington (1962), Braziel and Terrell (1962) and others have reported training benefits over even shorter periods. Another possibility is that the individual activities presented in the training program were not repeated often enough to produce the desired results.

Field Variables

It was not possible to manage all the variables in the experiment which might have been significant. For instance, initial screening took place during a period in which the schools were experiencing a severe epidemic of influenza. Absentee rates ranged as high as 25 percent on some days on which identification tests were administered. Make-up tests were possible for only a portion of those missed. It is possible that many critical subjects were not included in the study.

During the training program, absentee rates varied greatly among experimental subjects. Repeat lessons were not feasible for those not present, and this may have affected their criterion measure scores.

Of course there were differences in the interest, ability, and motivation of the teachers who took part in the project. The frustration indigenous to this variable was pointed out by Brownell who contended that

> A system of instruction represents no more than a paper organization. In the best of circumstances it cannot be truly prescriptive in the sense that all teachers who agree to teach according to that program will do the same things in the same way and will refrain from doing anything not specifically required by that system (1966, p. 83).

In the study under investigation, care was exercised to keep treatment constant by providing daily lesson plans and materials and by information bulletins and weekly visits to each school by the project director. Still there is no way to guarantee that all required procedures were followed in every situation.

It is assumed that any variations caused by the forementioned limitations were randomly distributed.

Program Deviations

As for the training program itself, two deletions were made from the list of activities recommended by Kephart. Trampoline training was on the schedule but was canceled because of technical difficulties. Pegboard exercises were not included in the schedule because of lack of time. Kephart considers trampoline and pegboard activities to be important features of his program.

Vision Testing

Although the Modified Clinical Technique procedures were very carefully followed, no direct measure of near visual acuity was included in the visual assessment battery. Many optometrists contend that an examination of the scope of the Modified Clinical Technique (which includes tests of far acuity, refractive error, coordination, color, and inspection for structural defects) is sufficient for all practical purposes (Blum and others, 1959). Robinson, however, feels that a separate test of near acuity should not be overlooked since her studies have revealed a lower correlation between an individual's far and near acuity than between the far acuity of each of his two eyes (1953). Since the act of reading from books involves the nearpoint ocular accommodative mechanisms, it might have been more appropriate if a direct measure of near acuity had been obtained.

Implications

Although it was hypothesized that there was a significant relationship between readiness, visual acuity and the effects of a training program for perceptually handicapped kindergarteners, the results failed to substantiate that assumption. Instead, the results indicate that future investigation might more profitably focus on examining the relationship of factors associated with socio-economic status. These implications will be indicated among the suggestions for further research.

Noteworthy were the consistent findings of no significant differences as a result of Kephart-type training. This suggests that schools should be wary of uncritically adopting mass reading readiness programs which call for training in eye movements and large muscle coordination.

Suggestions for Further Research

The major finding of the study was that socio-economic status factors were more highly related to the perceptually handicapped child's reading readiness than either visual adequacy or the particular training program employed. This points out a need for further investigation to determine which of several possible factors associated with socio-economic factors are responsible for these differences. A comparison of perceptually handicapped groups equated for intelligence, educational level of parents, and ethnic background might yield significant information.

Among the related questions raised by this study and some suggested procedures for finding possible answers are the following:

1. Is Kephart training for fifteen minutes a day for eight consecutive weeks sufficient to produce measurable differences? The experiment could be carried on for one or two year's time to see if longer periods of Kephart training produced different results.

2. Is Kindergarten age the most appropriate age for administering Kephart training? The experiment could be replicated with pre-schoolers and first graders to see if this kind of perceptual training is more effective at some other age than the one chosen for this study.

3. Could Kephart training have a delayed effect on the acquisition of reading skills? The same children in this study could be retested for reading skill achievement at six months intervals during the next few years.

4. Are there certain treatments in the Kephart program which are specific to certain visual and/or perceptual inadequacies? Matched groups of children with similar specifically diagnosed visual and perceptual problems could be compared after undergoing isolated aspects of Kephart training.

5. Could scores on a screening test for perceptual adequacy be more a function of intelligence than of visual perception? Correlating the results of tests of perception with

tests of ability for a very large number of children might indicate the extent of this relationship.

6. Is it possible that some other vision defect, rather than poor far visual acuity, contributes to perceptual disabilites in children? Errors of refraction, coordination, near acuity and color could be analyzed for a large group of children and correlated with the results of tests of visual perception.

7. Would the results of this study have been different had the same teacher worked with all the training groups? Rather than having nine different persons administering the training as in this study, another investigation might employ one such person to work with all children being treated.

8. Are there socio-economic differences in the results of tests of visual perception? Existing standardized instruments for assessing perception could be extended to include different populations. Norms based on specific socio-economic groups could be developed.

9. Is it possible that "perceptual handicap" is not a physiological phenomenon but rather only a theoretical construct invented to account for the fact that some children have unexplained difficulty in learning to read? If this is the case, then Kephart-type training may well be irrelevant and future researchers might better turn their attention to investigating more direct techniques for helping children acquire reading skills.

Appendix A

Kindergarten Reading Readiness Project

Lesson Plans for Perceptual Training

Monday, March 14, 1966

Chalkboard (Directionality) -- see pp. 169-171
Walking Board Forward -- see pp. 217-218

Tuesday, March 15, 1966

Same as yesterday

Wednesday, March 16, 1966

The Clock Game -- opposed movement toward the center -- pp. 171-174 and 175-1 (a)
Walking Board Forward -- pp. 217-218

Thursday, March 17, 1966

Same as yesterday

Friday, March 18, 1966

The Clock Game -- opposed movement away from center -- pp. 174, 177 and 175-1 (b)
Walking Board Forward -- pp. 217-218

Monday, March 21, 1966

The Clock Game -- same as Friday
Walking Board Forward
Walking Board Backward -- pp. 218-219

Tuesday, March 22, 1966

*Ocular Pursuit Training -- Stage 1, pp. 241-242, pp. 146-150 (if necessary, drop to Stages 2, 3, 4, or 5)
Walking Board Backward -- pp. 218-219

Wednesday, March 23, 1966

Same as yesterday

*Use thumbtack on pencil

Appendix A (Cont'd)

Thursday, March 24, 1966

*Ocular Pursuit Training -- same as yesterday
Angels-in-the-Snow -- bilateral -- pp. 230-231

Friday, March 25, 1966

Same as yesterday

Monday, March 28, 1966

The Clock Game -- opposed movement toward and away from center -- pp. 173-177
Angels-in-the-Snow -- bilateral -- pp. 230-231

Tuesday, March 29, 1966

The Clock Game -- parallel movement -- pp. 177-178
Angels-in-the-Snow -- unilateral -- pp. 230-231

Wednesday, March 30, 1966

Same as yesterday

Monday, April 11, 1966

*Ocular Pursuit Training -- Stage 1, pp. 241-242, pp. 146-150 as before
Balance Board with largest post -- simple balancing -- p. 222

Tuesday, April 12, 1966

No training

Wednesday, April 13, 1966

Balance Board as on Monday
Walking Board -- forward and backward

Thursday, April 14, 1966

Marsden Ball -- pp. 254-255 -- touching with finger
Balance Board -- pp. 222

*Use thumbtack on pencil

Friday, April 15, 1966

Trampoline (Recreation Department)

Monday, April 18, 1966

Clock Game -- movement with crossed meridians -- pp. 178-179
Do movement toward center -- p. 75 -- the first 9
Balance Board -- p. 222 -- use next smaller post if children have learned to use the largest one

Tuesday, April 19, 1966

No training

Wednesday, April 20, 1966

Clock Game
Walking Board -- walking sideways -- p. 219

Thursday, April 21, 1966

Clock Game -- same as Monday but do second 9 -- bottom of p. 175
Walking Board -- walking sideways as yesterday

Friday, April 22, 1966

*Ocular Pursuit Training -- repeat Stage 1 -- p. 242; pp. 146-150 as on Tuesday, March 22.
Walking Board -- front, back and sideways

Monday, April 25, 1966

Stick Figures -- pp. 262-264, A, Task 1 (square), 1,2,3, and 4
Angels-in-the-Snow -- pp. 230-232 -- bilateral and unilateral movements

Tuesday, April 26, 1966

Same as yesterday

Wednesday, April 27, 1966

Stick Figures -- pp. 262-265, B, Task 2 (rectangle), 1, 2,3, and 4
Angels-in-the-Snow -- pp. 230-232 -- cross lateral movements

*Use thumbtack on pencil

Appendix A (Cont'd)

Thursday, April 28, 1966

Same as yesterday

Friday, April 29, 1966

Balance Board, Walking Board -- review

Monday, May 2, 1966

Stick Figures -- p. 265, C, Task 3 (triangle), 1,2
Walking Board -- p. 219, 220, turning and bouncing

Tuesday, May 3, 1966

Same as yesterday

Wednesday, May 4, 1966

Stick Figures -- p. 265, D, Task 4 (diamond), 1,2
Walking Board -- pp. 219, 220 -- turning and bouncing as yesterday

Thursday, May 5, 1966

Stick Figures -- same as yesterday
Balance Board -- p. 222 -- using smallest post for those able to use it. From now on, use smallest post if possible. However, if child cannot use smaller post, substitute others.

Friday, May 6, 1966

Stick Figures -- p. 265, E, Task 5 (divided square)
Balance Board -- p. 222

THE END, AND WE THANK YOU.

Appendix B-1

Frequency Distribution of Perceptual Quotients in the Major Study

Perceptual Quotient	Number of Students
92	5
91	5
90	0
89	1
88	0
87	4
86	0
85	8
84	0
83	11
82	3
81	1
80	0
79	2
78	1
77	1
76	3
75	0
74	1

Appendix B-1 (Cont'd)

Perceptual Quotient	Number of Students
73	3
72	3
71	1
70	3
68	1

Appendix B-2

Frequency Distribution of Perceptual Quotients in the Normal Perception Study

Perceptual Quotient	Number of Students
118	1
117	0
116	0
115	0
114	1
113	1
112	1
111	0
110	1
109	0
108	2
107	0
106	0
105	0
104	0
103	1
102	2
101	0
100	4
99	0

Appendix B-2 (Cont'd)

Perceptual Quotient	Number of Students
98	3
97	0
96	4

Appendix C-1

Raw Scores of the Criterion Measures of the Major Study

	Training - Good Vision - High SES				
Ginn Pre-Reading Test #3	Lee-Clark Reading Readiness				
	Test 1	Test 2	Test 3	Test 4	Total
5	2	12	18	14	46
7	2	1	14	6	23
10	11	11	18	15	55
10	11	12	15	14	52
11	10	11	17	10	48
12	6	12	18	5	41
12	6	12	16	6	40
15	9	10	17	11	47
	Training - Poor Vision - High SES				
2	7	12	18	15	52
5	4	11	17	8	40
9	7	12	18	15	52
9	4	11	19	8	42
10	4	12	18	10	44
11	12	12	20	15	59
11	8	10	16	10	44
12	9	12	19	11	51
12	9	12	16	10	47
13	9	12	17	15	53
15	5	11	15	15	46

Appendix C-1 (Cont'd)

Ginn Pre-Reading Test #3	Lee-Clark Reading Readiness Test 1	Test 2	Test 3	Test 4	Total
	Training - Good Vision - Low SES				
4	4	7	16	6	33
5	5	11	17	18	51
11	2	11	17	13	43
12	11	12	12	18	46
14	5	12	15	8	40
14	2	12	17	14	45
	Training - Poor Vision - Low SES				
2	9	2	15	14	40
4	3	3	16	3	25
5	2	2	14	13	31
9	2	3	16	6	27
13	6	12	15	14	47
	No Training - Good Vision - High SES				
3	5	5	14	9	33
6	8	10	17	17	52
6	4	1	14	16	35
11	10	12	15	16	53
11	8	12	16	17	53
15	8	11	17	10	46

Appendix C-1 (Cont'd)

No Training - Poor Vision - High SES

Ginn Pre-Reading Test #3	Lee-Clark Reading Readiness				
	Test 1	Test 2	Test 3	Test 4	Total
7	10	12	15	13	50
8	1	6	15	6	28
10	7	12	18	17	54
11	6	12	17	14	49
14	7	10	18	10	45
15	7	12	18	15	52
15	8	11	17	12	48
No Training - Good Vision - Low SES					
3	8	2	14	3	27
5	5	11	16	9	41
5	8	11	14	5	38
10	5	12	15	12	44
10	4	10	15	4	33
14	7	12	15	11	45
14	11	12	18	19	60
14	11	12	17	13	53
No Training - Poor Vision - Low SES					
1	9	5	15	12	41
3	3	3	16	8	30
3	3	0	3	3	9
15	9	12	15	15	51
15	8	12	16	17	53

Appendix C-2

Raw Scores of the Criterion Measures of the Normal Perception Subjects

Training - Good Vision

Ginn Pre-Reading	Lee-Clark Reading Readiness				
Test #3	Test 1	Test 2	Test 3	Test 4	Total
6	6	10	19	15	50
7	7	11	15	6	39
13	8	12	18	15	53
12	11	12	19	15	57
13	10	12	20	19	61
15	3	12	18	19	52
15	10	12	16	18	56
Training - Poor Vision					
11	8	12	19	20	59
11	10	12	17	14	53
13	11	12	15	14	52
15	12	12	16	16	56
No Training - Good Vision					
7	5	7	17	18	47
10	8	12	17	16	53
11	10	12	18	16	56
14	7	12	19	14	52
15	10	12	17	15	54

Appendix C-2 (Cont'd)

No Training - Poor Vision

Ginn Pre-Reading Test #3	Lee-Clark Reading Readiness Test 1	Test 2	Test 3	Test 4	Total
15	8	11	20	16	55
14	10	12	14	18	54
14	8	12	18	16	54
13	3	11	13	11	38
10	6	10	17	14	47

Appendix D

Categories for Socio-Economic Status Classification

Weighting	Occupational Examples	Worth of Dwelling
1	Professional, Executive	$30,000 and up
2	Managerial	20,000-30,000
3	Small Business Skilled Laborer	10,000-20,000
4	Retail Clerical, Sales, Semi-skilled Laborer	5,000-10,000
5	Unskilled Construction Migrant Laborer Chronically Unemployed	0-5,000

Frequency Distribution

Combined Weightings	Frequency
1-2	3
3-4	17
5-6	10
7-8	3
9-10	24

Appendix E

A Copy of the Form used for Recording Results of the Vision Tests

MCT Record

Name____________________________________ School________________

Age______ Session_______________

Remarks____

____

____

____

Visual Acuity - at 20'

Right eye 20/

Left eye 20/

Coordination-

at 20'_____ESO _____:_____EXO_____:_____Hyper_____

at near_____ESO _____:_____EXO_____:_____Hyper_____

Refractive Error

Right eye 90° _____: 180° _____

Left eye 90° _____: 180° _____

Color (HRR) ____

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